

5.5 Properties of Logarithms

Name _____ Date _____ Period _____

1. $\log_a 1 =$ _____ 2. $\log_a a =$ _____ 3. $a^{\log_a M} =$ _____
4. $\log_a a^r =$ _____ 5. $\log_a (MN) =$ _____ 6. $\log_a \left(\frac{M}{N} \right) =$ _____
7. $\log_a M^r =$ _____ 8. If $\log_a x = \log_a 6$, then $x =$ _____.
9. If $\log_8 M = \frac{\log_5 7}{\log_5 8}$, then $M =$ _____.
10. **True or False:** $\frac{\ln 8}{\ln 2} = 2$
11. **True or False:** $\ln(x+3) - \ln(2x) = \frac{\ln(x+3)}{\ln(2x)}$
12. **True or False:** $\log_2(3x^4) = 4\log_2(3x)$

Use properties of logarithms to find the exact value of each expression. Do not use a calculator.

13. $\log_2 2^{-13}$ 14. $2^{\log_2 7}$ 15. $\log_8 2 + \log_8 4$
16. $\log_6 18 - \log_6 3$ 17. $\log_3 8 \cdot \log_8 9$ 18. $3^{\log_3 5 - \log_3 4}$

Suppose that $\ln 2 = a$ and $\ln 3 = b$, use the properties of logarithms to write each logarithm in terms of a and b .

19. $\ln \frac{2}{3}$ 20. $\ln 0.5$ 21. $\ln 8$

Write each expression as a sum and/or difference of logarithms. Express exponents as factors using the power property.

22. $\ln(ex)$ 23. $\ln\left(\frac{e}{x}\right)$ 24. $\ln\left(\frac{x}{e^x}\right)$

$$25. \log_a(u^2v^3) \quad u > 0, v > 0$$

$$26. \ln(x^2\sqrt{1-x}) \quad 0 < x < 1$$

$$27. \log\left[\frac{x^3\sqrt{x+1}}{(x-2)^2}\right] \quad x > 2$$

$$28. \ln\left[\frac{x^2-x-2}{(x+4)^2}\right]^{1/3} \quad x > 2$$

Write each expression as a single logarithm.

$$29. 3\log_5 u + 4\log_5 v$$

$$30. 2\log_3 u - \log_3 v$$

$$31. \log\left(\frac{x^2+2x-3}{x^2-4}\right) - \log\left(\frac{x^2+7x+6}{x+2}\right)$$

$$32. 8\log_2 \sqrt{3x-2} - \log_2\left(\frac{4}{x}\right) + \log_2 4$$

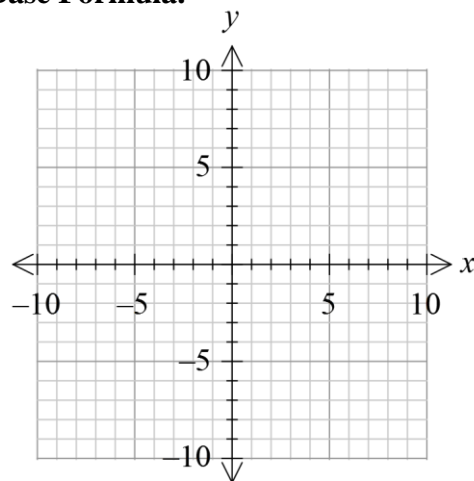
Use the Change-of-Base Formula and a calculator to evaluate each logarithm. Round your answer to three decimal places.

$$33. \log_3 21$$

$$34. \log_5 18$$

Graph the function using a graphing calculator and the Change-of-Base Formula.

35. $f(x) = \log_5 x$



Use the properties of logarithms to express y as a function of x . The constant C is a positive number.

36. $\ln y = \ln x + \ln C$

37. $\ln y = \ln x + \ln(x+1) + \ln C$